Industry Growth Forum

November 3-4, 2015

Executive Summary

LiquidCool Solutions Cools Electronics by Total Immersion in a Dielectric Fluid

- **Significantly reduces datacenter CapEx and OpEx, increases equipment reliability, cuts space requirements, conserves water and runs silently.**
- **Customers pay less upfront, and every day the data center operates.**
- **Maintenance is quick and neat.**
- **Protected by 22 patents**
- **Validated by Lawrence Berkeley National Laboratory, the National Renewable Energy Laboratory and Intel.**
- **Experienced management team with a proven track record of generating high returns on invested capital.**
- **$5-million Series B Preferred round**

LCS Did Not Invent Liquid Cooling - We Just Make It Practical

Value Proposition

- **Reduces Capital Cost** - Eliminates mechanical refrigeration, rack fans, air handlers, humidity control, high ceilings, and raised floors
- **Reduces Operating Cost** - Reduces the power to cool by 98%. Waste heat can be easily reclaimed for other uses. There are no chillers, DX units, humidifiers or fans to maintain
- **Conserves Water** - No water is used, period.
- **Increases Server Lifetime** - Sealed system isolates electronics from the environment
- **Improves Reliability** - Eliminates fans, isolates electronics from environmental impurities, dampens thermal cycling and lowers operating temperatures
- **Silent Operation** - Fan noise and vibration are eliminated
- **Supports High Density** > 75kW per rack

Team

There are 15 members on the LCS team including:

Herb Zien (CEO) - Degrees from Cornell and MIT. Cofounded a firm that became the largest owner of District Energy Systems in the U.S.; Sold for $800 million and equity investors realized a 22% annualized return; Nine published articles on datacenter cooling.

Rick Tufty (VP Engineering) - Executive Director of Engineering for Dell's Enterprise Division responsible for product development for servers, blades, and storage systems; Senior Director of Engineering and Corporate Research Fellow at Maxtor Corporation responsible for product development of high performance rotating storage devices; Holds 14 patents.

Dave Roe (Sales Leader & Project Manager) - Executive Project Manager at IBM; 15 years of project management experience in software and systems development; Teaches project management courses at the collegiate and graduate levels.

Daryl Lautenschlager (Test Manager) - Masters Certificate in Database Management; Responsible for Field Engineering, Quality, Programming, Management, and Testing at IBM and Hitachi.

Harsh Patel (Test Engineer) –MSME from University of Texas-Arlington; Worked on Intel's server and the Facebook Data Center Project.

Air is a Problem

Cooling with Air is Expensive

- Air Cooling Wastes Space

- Air Cooling Limits Power Density

- Air Cooling Reduces Reliability
  - Fans Fail
  - Air Causes Oxidation and Corrosion
  - Air Enables Large Temperature Swings

- Air Cooling Wastes Energy
  - Up to 15% of Total Power is used to Move Air
  - Up to 20% More Power is used by Rack Fans
  - Fans Generate Heat that must be Dissipated

LCS Coolant =

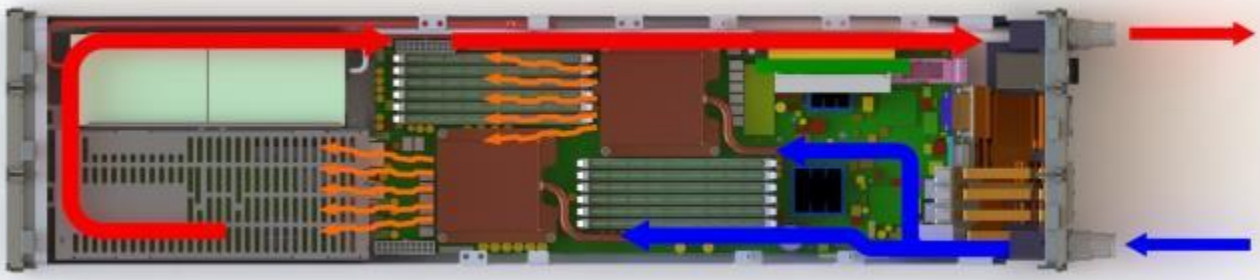
LCS Offers an Elegant Solution

Total liquid immersion in a eco-friendly dielectric fluid

- **"Cool" liquid is circulated directly to hottest components first. Remaining components are cooled by bulk flow as the dielectric liquid exits the chassis.**
- **Directed flow is a key differentiator**
- **No fans or other moving parts in the chassis**
- **Rack-mounted devices are easy to maintain**
- **Off-the-Shelf Components**

22 granted patents

17 patents pending



Up to 125°F

Up to 110°F

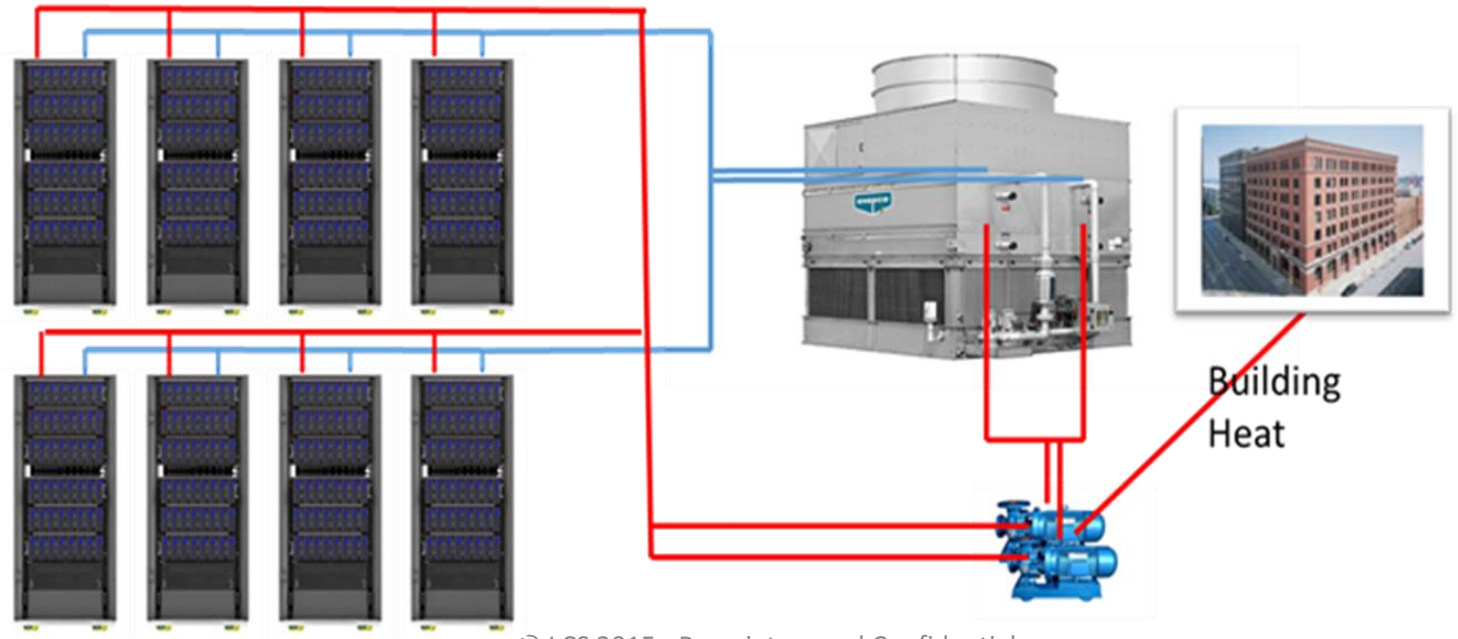
No Moving Parts - Flow Rate: 0.25 gal/min

How it Works

Heat Dissipation

LCS Cooling System Elements

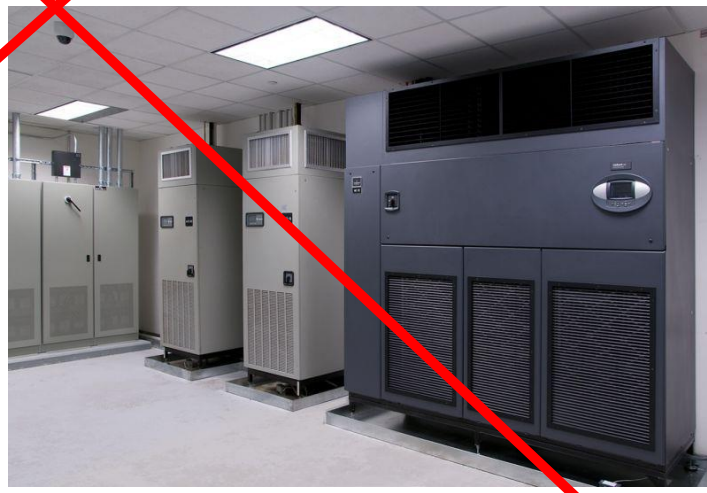
- **Pump supplies dielectric liquid to multiple IT racks**
- **Incoming fluid can be as hot as 110°F, which completely eliminates mechanical refrigeration and evaporative cooling**
- **Leaving liquid can be as hot as 120°F, suitable for energy recovery**
- **Heat is dissipated by a dry fluid cooler if there is no energy recycling option**



Infrastructure Elimination

What LCS Does Not Need

- Mechanical Refrigeration
- Cooling Towers
- Air Handlers
- Humidity Control
- Blade and Rack Fans
- Mixing Dampers
- High Ceilings
- Hot Aisles
- Noise
- Water
- Very much space



3rd Party Validation

Lawrence Berkeley National Laboratory

- Lawrence Berkeley National Laboratory assessed LiquidCool technology for the US Navy's Transformative Reductions in Operational Energy Consumption (TROPEC) program for continuous operation of servers and communication/network equipment in tropical environments with no mechanical cooling.
- The Coefficient of Performance for the LCS system was 49.9 at full load compared to 1.6 for current practice, 30 times better.

National Renewable Energy Laboratory

- Preliminary data from the testing program, currently underway, suggest that more than 85% of the electric energy used by LCS servers can be recycled to create hot water for building heat.
- The test program will conclude in November at which time the LCS rack and servers will be moved to NREL's high performance computing center.

Intel

- Confirmed that the LCS dielectric fluid does not have a deleterious effect on Intel processors, and all processor cores and memory operated well within the normal operating range even at coolant temperatures of 122°F
- As a result of this study and other investigations it undertook, Intel committed to extend normal warranty terms to processors immersed in the dielectric fluid LCS employs.

Competition

Three Liquid Cooling Technologies:

1. **<u>Cold Plates</u> – Requires Fans**
   - – Shifts heat from processors but does not save much energy
   - – Mechanical cooling needed above 85°F
   - – Maximum rack density is 30-kilowatts

2. **<u>In-Row Cooling</u> – Requires Fans**
   - – Makes the room smaller
   - – Mechanical cooling above 80°F
   - – Maximum rack density is 35-kilowatts

3. **<u>Total Immersion in a Dielectric Fluid</u> – No Fans; > 75kW rack density**
   - **Green Revolution Cooling**
   - **Iceotope**
   - **3M (Allied Control and SGI)**
   - **LiquidCool Solutions**

LCS Competitive Advantage

Any Shape or Size

~~Green Revolution, Iceotope, 3M~~

No Water in Datacenter

~~Iceotope, 3M~~

Scalability

~~Green Revolution, 3M~~

Easy to Swap & Maintain Devices

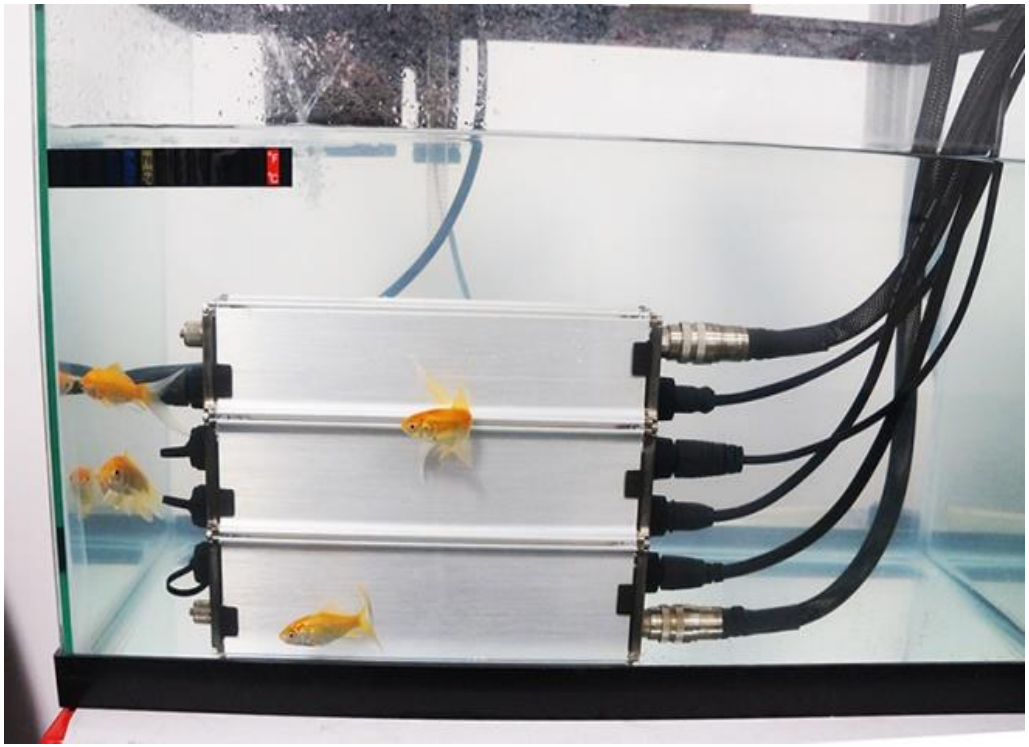
~~Green Revolution, Iceotope, 3M~~

Harsh Environment Deployments

~~Green Revolution, 3M~~

Low Cost

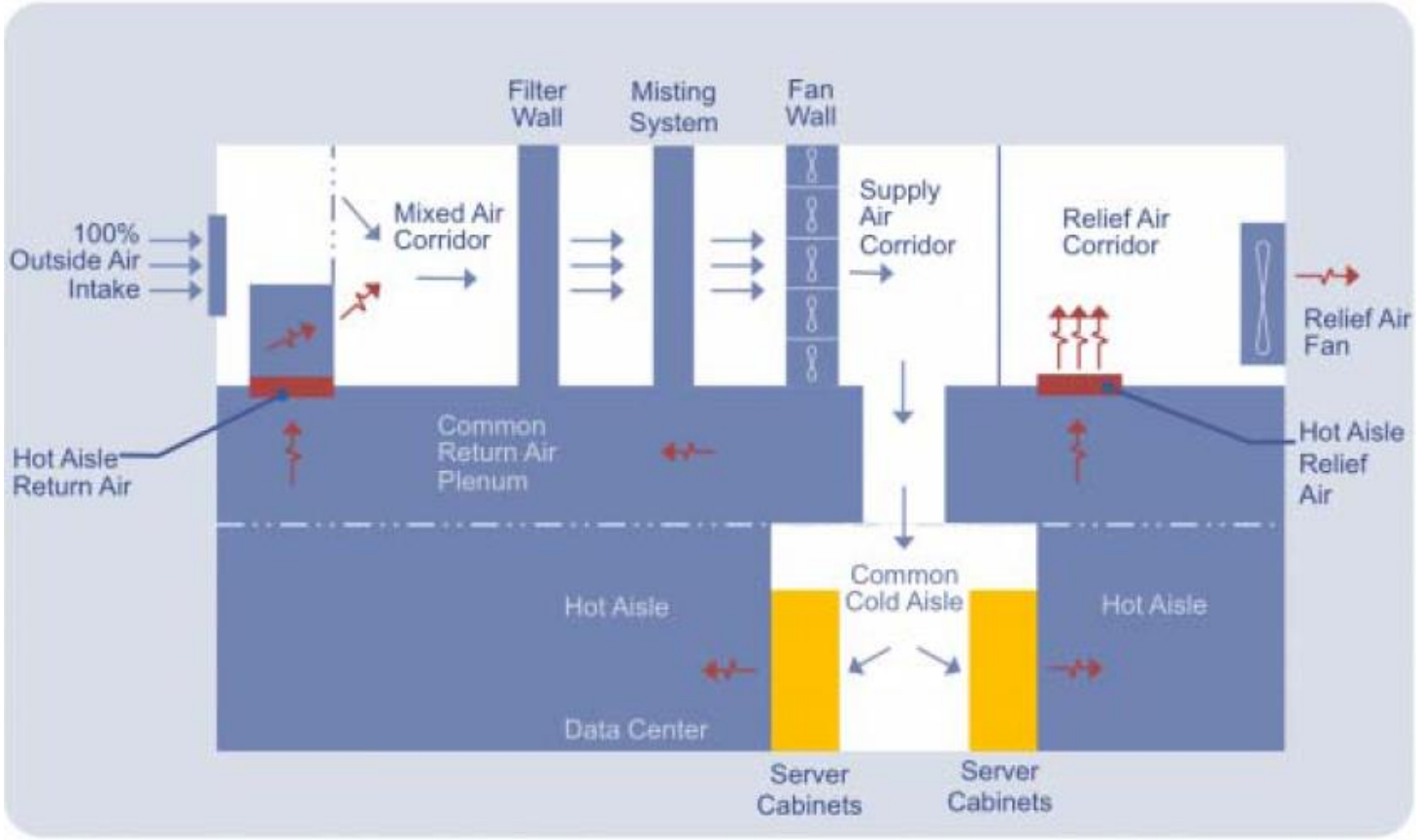
~~Iceotope, 3M~~



Liquid Submerged Computer Operating Underwater in an Aquarium

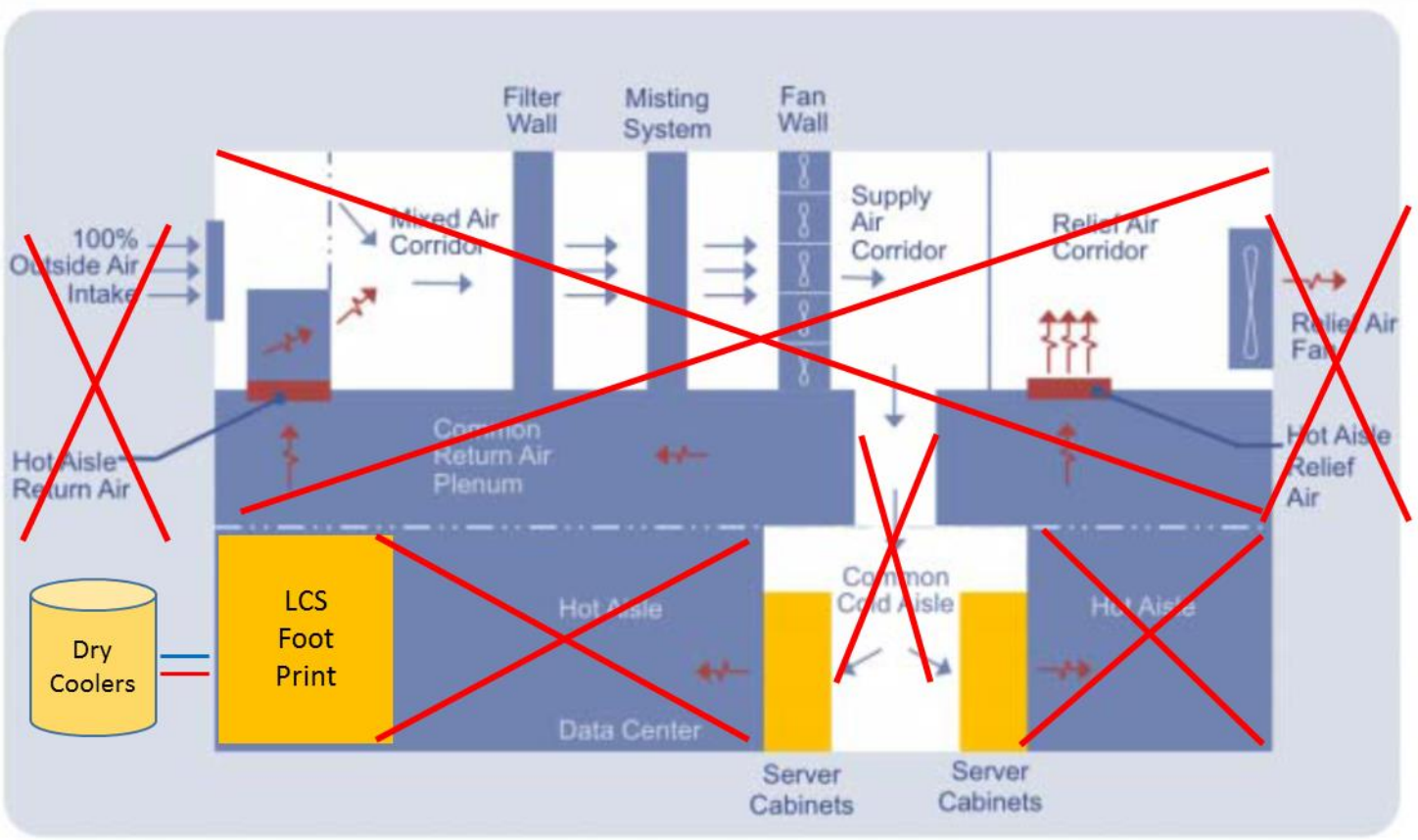
Case Study: Facebook Data Hall

- 1.4 million cubic feet of air per minute
- Drinks up to 50 gallons per minute of water
- Mechanical refrigeration required when indoor humidity is too high
- 3 story building



Facebook: Data Hall after LCS

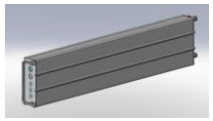
LCS eliminates all of that!



Products

Rugged Terrain Computer (RT)

High performance computer that is ideal for factory floors, construction sites, etc.
Manufactured by Dedicated Computing.



Liquid Submerged Server (LSS Rack)

High density, easy to maintain, Cooling PUE<1.02

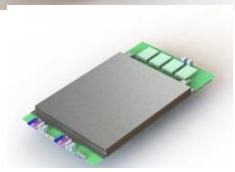
Manufactured by Dedicated Computing.

Explorer

Rugged, mobile 4kW compute system that is ideal for field data processing

Three heat rejection options

Manufactured by Dedicated Computing



Clamshell Server

Low cost Open Compute Project servers for cloud datacenters

Manufactured by Herold Precision Metals

200 Kilowatt Prefabricated Module (PFM)

Unique computing appliance that can be transported by cargo plane

Johnson Controls is the module manufacturer and project integrator

750 Kilowatt PFM

Unique computing appliance that replaces five air-cooled PFMs

Johnson Controls is the module manufacturer and project integrator

Marketing Strategy

- **LCS cooling technology addresses a $100 billion market.** Datacenters, Prefabricated Modular Datacenters, Embedded Computers, Military Equipment, Harsh Environment Computing and Academic Research.

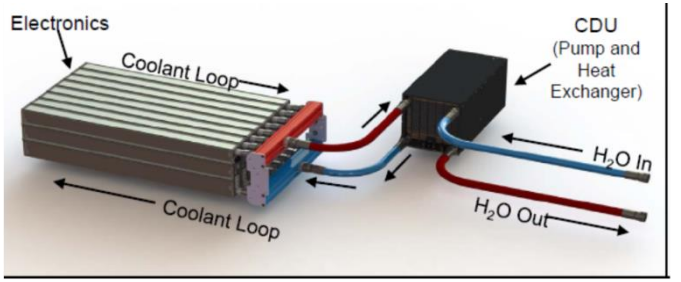
- **LCS goes to market by licensing IP to Channel Partners.** leverages Channel Partners' balance sheets, credit, sales force, manufacturing capability and customer support, and avoids the expense of competing with them.

- **The Channel Partner list is expanding**, and currently includes:
  - OEMs – Dedicated Computing, Herold Precision Metals, Flextronics, Supermicro
  - Integrators – Johnson Controls, IRTS
  - Reps – EMA Sales

Installations

Liquid Submerged Server Rack

- **University of Minnesota Supercomputing Institute**
- **Microsoft Technology Center - Minneapolis**
- **Dedicated Computing**
- **National Renewable Energy Laboratory**



Rugged Terrain Computer (started shipping in August, 2015)

Installed

- **JBS Tannery**
- **George Washington University**
- **Stanford SLAC National Accelerator Laboratory**
- **Colorado Judicial Courts**
- **Brookdale Health**

Scheduled

- **CISCO Systems**
- **MITRE**
- **CoreFocus**
- **United Healthcare**
- **Wisconsin Electric**

Market Penetration

- **LCS technology offers vastly superior functionality over current products**
  - Explorer: Rugged, Versatile, High Powered, Inexpensive
  - Clamshell: Costs the same as air but much more efficient and much higher density
  - 200kW PFM: Transported by cargo plane
  - 750kW PFM: Highly capital efficient – replaces five air-cooled modules

- **LCS cooling enables an entirely different class of IT products, but market penetration will ramp slowly until there is field experience by early adopters**

- **LCS revenue grows in lockstep with Channel Partners, and they do not need to dominate their respective markets for LCS to achieve projected revenue targets.**

# of Units Sold	2015 Market Esimate		LiquidCool Solutions			
			2016	2017	2018	2019
PCs	62,993,000	IDC	1,000	3,168	6,336	9,504
Servers	3,319,000	IDC	7,247	25,383	47,415	78,119
PFMs	1,430	451 Research	3	6	13	25

Series B Preferred Round

Series B funding will be used to accelerate marketing efforts, expand the patent portfolio and develop unique solutions for target applications

Sales and Marketing		
Staff	$	1,000,000
Demonstrations, including mobile units	$	1,000,000
Sales offices	$	150,000
Website, tradeshows	$	100,000
Total	$	2,250,000
Engineering and Product Development		
Additional R&D personnel	$	500,000
Server and switch platforms	$	500,000
Cooling infrastructure	$	300,000
Patent development	$	250,000
Engineering tooling and equipment	$	200,000
Total	$	1,750,000
Working Capital	$	1,000,000
TOTAL	**$**	**5,000,000**

Why Invest in LCS?

1. **Addressable Market is Enormous, $100+ billion and growing**

2. **LCS Technology Really Moves the Needle: significantly reduces capital and operating costs, saves energy and Space, conserves water, enhances reliability, eliminates noise**

3. **Robust Patent Portfolio, 22 issued and 17 pending, protects market position**

4. **Lean Business Model leverages Channel Partner assets and minimizes the need for growth capital**

5. **Management Team has a Proven Track Record**

More Information

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Explorer @ Emerald Warrior Maneuvers